SENSOR HAVING A MODULAR CONNECTION

The invention relates to a sensor having a basic body and a sensor element, in particular for converting and/or transmitting measured variables.

Prior art

Sensors are used in the most varied forms in virtually all industrial applications. Wherever processes must be monitored and/or controlled, it is necessary for the variables to be measured to be sensed, if appropriate converted, passed on and, if appropriate, processed.

In accordance with the physical variable to be measured, the sensors are equipped with sensor elements suitable for the purpose. These sensor elements must be reactive to the physical variable to be measured. In most cases, it is desirable that the physical variable to be measured is converted into another physical variable, in particular electric or optical signals.

The boundary conditions in the respective case of use dictate the form and configuration of the sensors. Thus, various cases of use can require the need to use sensors that are respectively individually tailored. This can result in high production costs for the sensor system of a plant and/or in a case of use.

Object

It is the object of the present invention to provide a sensor for the respective application that can be used multifariously and variably.

Achievement of the object

The achievement of this object results from the fact that the sensor element is assigned a recording element.

The recording element transmits the variable to be measured, but still does not perform any conversion of measured variables. Consequently, the material requirements placed on the recording element are not particularly high, and so simple and cost-effective materials can be used. Also, these materials can expediently be easily processed, and can thus be adapted quickly and easily to local conditions.

When it is possible for the adaptation to the spatial conditions to be limited to the recording element, it is always possible to use the same sensor element, which can be fastened on a basic body and is always the same. Only the recording element is adapted. It is possible in this way for a sensor to be produced quickly and cost

effectively for a specific application by simple adaptation of the recording element to local conditions.

It is advantageously possible to assign the sensor element different recording elements. As a result, the sensor can be produced quickly for a specific case of use with specific spatial boundary conditions by assigning a specific recording element.

The recording element can preferably be exchanged or detached. This is done using a type of modular system. Consequently, the sensor can be used consecutively in time with different recording elements with a sensor element, this being done in various cases of use. This is of great interest when the measurement requires an expensive sensor element that need not always be used and can be used at another location.

If the sensor element is permanently connected to the recording element, in particular bonded, pinned, riveted or pressed, cases of use are possible where properties of a non-detachable connection are required.

Adaptation to local conditions is frequently done by adapting the sensor to a specific size and forms of the cutout. In particular, the cutout is frequently a bore. The adaptation of the sensor is advantageously performed

by adapting the recording element to these bores. In the most favorable cases, a tip with a cross-sectional shape and/or end face is formed on a raw recording element such that the recording element can be inserted into the bore provided for the purpose.

The sensor element is advantageously connected to the basic body in a re-detachable fashion. This broadens the idea of the principle of the modular system to the effect that various forms of sensor elements can be used. This can be interesting wherever it is insufficient for only the recording element to be adapted to the local conditions.

It is, furthermore, conceivable that the sensor elements that can be assigned differ from one another in the type of measured variable to be converted. Thus, on one occasion the basic body could be assigned a sensor element that is sensitive to temperature, and on another occasion a sensor element sensitive to pressure.

In an advantageous refinement, the recording element is a pressure and/or force transmitting element. In this application, use can be made of materials that are particularly easy and advantageous to process. For example, but not exclusively restrictive thereto, consideration is given here to the use of sensors in

injection molds, where a cavity pressure can be transmitted via such a force transmitting element onto a sensor element. By adapting the sensor element to the boundary conditions of the respective case of use, it is possible for the sensor thereby to be used more multifariously.

In the application outlined by way of example of the injection mold with an identical basic body but different sensor elements and/or recording elements, it would be possible to measure not only the pressure, but also the temperature.

Description of the figures

Further advantages, features and details of the invention emerge from the following description of preferred exemplary embodiments, as well as with the aid of the drawing, in which:

figure 1 shows a longitudinal section through a pressure sensor for measuring the pressure of a cavity in an injection mold, in the position of use;

figure 2 shows a schematic view of a longitudinal section of a number of pressure sensors having different recording elements, in the position of use;

figure 3 shows a partial section through a force sensor having a recording element in the wall of a cavity;

figure 4 shows a plan view of the force sensor from figure 3 without the recording element.

A sensor 1 can be seen in figure 1 that is installed in a wall 2 of a cavity 3 of an injection mold. The task of the sensor 1 is to measure in the cavity 3 the pressure of the molten plastics material which is being cured. It consists of a basic body 4, a sensor element 5 and a recording element 6. A cable 7 leads rearward, for

example via a cable channel, to an evaluation unit (not illustrated).

The basic body 4 is screwed in the wall 2 by means of a thread 8. Adjoining the basic body 4 in the direction of the cavity 3 is the sensor element 5, which is guided in a bore 9. The recording element 6 is arranged between the sensor element 5 and the cavity 3. The recording element 6 is screwed to the sensor element 5 via a thread 10. A tip 11 of the recording element 6 is guided in a bore 13, and an end face 16 of the tip 11 lies in the plane of an inner wall 12 of the cavity 3.

A diameter of the bore 13 is smaller than the diameter of the bore 9. The base part 14, screwed to the sensor element 5, of the recording element 6 is likewise guided in the bore 9.

The recording element 6 is a pressure and/or force transmitting element.

The mode of operation of the invention is as follows:

During production of the sensor 1, the basic body 4 is connected to the sensor element 5 and the recording element 6. Thereafter, the sensor 1 is inserted into the

bores 9 and 13, provided therefor, in the wall 2, and screwed in the wall 2 by means of the thread 8.

In this arrangement, the pressure recording element 6 is adjacent to the cavity 3 and transmits the pressure in the cavity 3 to the sensor element 5, which performs a conversion of the measured variables. In particular, the cavity pressure, which is transmitted to the sensor element 5 via the recording element 6, can be converted into electric signals that are passed on to an evaluation unit (not illustrated) via the basic body 4 of the sensor 1 and via the cable 7. However, it is also conceivable for the sensor element 5 to convert the pressure into another variable that can be passed on, for example into an optical one, which is passed on to an evaluation unit via an appropriate transmitting means.

Visible in figure 2 are a number of sensors that are arranged in the wall 2 of the injection molding machine. They all consist of the same basic body 4. However, they vary in their sensor and recording elements 6. The end face 16.1 of the tip 11.1 of the recording element 6.1 has the smallest diameter. The base part 14.1 is bonded to the sensor element 5.1.

The tip 11.2 of the recording element 6.2 has a larger end face 16.2 than the tip 11.1 of the recording element

6.1. The base part 14.2 is pinned to the sensor element 5.2.

The tip 11.3 of the recording element 6.3 has an even larger end face 16.3. The recording element 6.3 is screwed with the aid of its base part 14.3 to the sensor element 5.3.

The three illustrations constitute a selection of various embodiments of the sensor 1. Firstly, various possibilities become plain for connecting the recording elements to the sensor elements, depending on the field of application. Furthermore, it becomes clear that various bores 13 on a wall 2 can be fitted with one and the same basic body 4 by means of various sensor and recording elements, without performing any hardware changes.

A further exemplary embodiment of a sensor 1.1 is illustrated in figure 3. This is a force sensor that has a basic body 4.1 and a sensor element 5.4 that is connected to a recording element 6.4. In this case, the connection is performed via a thread 10.1, as is to be seen from figure 4.

In this exemplary embodiment, as well, it is respectively possible to use the same basic body 4.1 and the same

sensor element 5.4 for different applications, doing so by selecting the recording element 6.4 and/or the tip 11.4 and/or the base part 14.4 in accordance with the requirements of the application and the local conditions.